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(54) Fixed-displacement vane-type hydraulic machine

Hydraulische Flügelzellenmaschine

Machine à palettes hydraulique

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Description

[0001] The present invention is directed to fixed-displacement vane-type hydraulic machines (pumps and motors), and more particularly to an improved vane-type hydraulic machine and method of assembly that provides structure between the cam ring and surrounding housing for absorbing reaction torque on the housing.

Background and Summary of the Invention

[0002] Vane pumps conventionally include a rotor coupled to an input shaft, a plurality of radial vanes carried by the rotor, side plates disposed on axially opposed sides of the rotor, and a cam ring carried between the side plates circumferentially surrounding the rotor. A plurality of fluid chambers are defined between the angularly spaced vanes, the axially spaced side plates and the radially spaced rotor and cam ring surfaces. A housing includes inlet and outlet passages for feeding hydraulic fluid to and from the chambers. Pressure applied to the pump creates a reaction torque on the cam ring, which must be absorbed by the surrounding housing. A similar reaction torque is created in vane-type hydraulic motors, in which flow of fluid through the housing and chambers provides a rotary output at the machine shaft.

[0003] US 543552 discloses a sliding vane pump having an inside liner with a constant radius pump arc and a constant radius stop arc, connected together by cycloidal arc. The liner has inlet slots arranged extending around a perimeter of a liner extending into the pump arc for maximum filling of the pumping volume. A herring-bone-shaped slot arrangement if provided on an outlet side which increases vane life, and increases sealing around the vanes around the outlet side, and decreases liner wear. A relief/fill porting arrangement is provided to pressurise the fluid in the pump chamber, or alternately to relieve pressure from the pump chamber. An improved thrust absorber is described particularly useful for truck mounting of the pump. An asymmetrical inside profile for the liner assists in pump operation by providing a fluid mathematical profile which approaches zero acceleration forces at the point of tangency.

[0004] US Patent No. 3479962 discloses a fluid pressure energy translating device having a cam ring with a pumping mechanism therein disposed between two deflectable pressure responsive cheek plates in which the clearance between the cheek plates and the pumping mechanism is dependent on the pressure balance thereacross. The cheek plates having balancing recesses thereon and facing the cam ring at a support surface to provide a more precise control of the pressure balance between the pressure plates and the pumping mechanism.

[0005] US Patent No. 4643623 discloses a holder for a rotary cutting tool. The holder has a holder body fixed to a spindle of a machine tool. A rotatable shaft concentric with the holder body and having a tool mounting portion at one end thereof is coupled at its other end portion to the holder body to receive torque from the holder body. The rotatable shaft is so mounted as to be radially displaceable and inclineable relative to the holder body. A positioning member is fixedly disposed on the machine tool body radially outwardly of the spindle, a cylindrical casing disposed radially outwardly of and rotatably engaged with the rotatable shaft such that the casing and the shaft are rotatable relative to each other, the casing being engageable with the positioning member for accurate positioning thereof by the positioning member, and thereby positioning the rotatable shaft. The holder may further have a circumferential lock mechanism for locking the casing and the holder body to prevent relative rotation between the casing and the holder body when the holder is not attached to the spindle, and for allowing relative rotation after the holder has been attached to the spindle.

[0006] US Patent No. 3788657 relates to a tool holder for use with a machine tool having a rotatable spindle and an automatic tool changing apparatus for positioning the tool holder in alignment with the spindle and for engagement therewith for performing a work operation on a workpiece by a tool carried in the tool holder. The tool holder includes a holder body having a shank adapted to be received in the drive spindle of a machine tool, and a radially outward extended peripheral flange. The flange is provided with a pair of elongated, radially inward extended pockets which are identically shaped and disposed on opposite sides of the flange. The elongated pockets are adapted to operatively receive complimentary shaped fingers of the tool gripping mechanism of an automatic tool changer apparatus. A pair of inserts having selectively spaced apart bores are adapted to be mounted in the elongated pockets to permit locating and securing the tool holder in a predetermined orientation in the tool gripping mechanism of the automatic tool changing apparatus.

[0007] It is a general object of the present invention to provide structure between the cam ring and the surrounding housing for absorbing the reaction torque caused by pressure applied to the machine. Another and more specific object of the present invention is to provide such torque-absorbing structure that is inexpensive, reliable, and can be readily implemented in vane-type machines of differing designs and constructions. Yet another object of the present invention is to provide torque-absorbing structure of the described character implemented in cartridge-type vane machines, which are currently preferred in the art, and/or which is adapted to be employed in machines for rotation in either direction. Yet another object of the invention is to provide a method of assembling machines of the described character.

[0008] According to a first aspect of the present invention there is provided a fixed displacement vane-type hydraulic machine that comprises:

a vane-type fluid mechanism including a rotor, a plurality of vanes carried by said rotor, side plates on opposed sides of said rotor, and a cam ring carried between said side plates surrounding said vanes and rotor to define fluid chambers between said vanes,
housing means surrounding and enclosing said mechanism, including inlet and outlet passage means for feeding fluid to and from said chambers,
a shaft coupled to said rotor and extending from said housing means, and torque means extending radially between said mechanism and said housing means and preventing rotation of said mechanism with respect to said housing means so as to absorb reaction torque on said mechanism with respect to said housing means due to pressure applied to said machine,
said torque means being affixed to said cam ring and extending into an opposed radial pocket in said housing means,

characterised in that the pocket is formed by said inlet and outlet passage means.

[0009] According to another aspect a method according to claim 7 is defined.

[0010] In the preferred embodiment of the invention, angularly spaced pins are affixed to, and project radially from, the cam ring. One of these pins is dimensioned for sliding fit with the surrounding housing during assembly The other pin functions to locate the cam ring with respect to the housing, and thereby to prevent angular misalignment of the cam ring and the housing. The pins and slots do allow for reverse rotation of the rotor mechanism within the housing.

Brief Description of the Drawings

[0011] The invention, together with additional objects, features and advantages thereof, will be best understood from the following description, the appended claims and the accompanying drawings in which:

FIG. 1 is a sectional view that bisects a fixed displacement vane pump in accordance with a presently preferred embodiment of the invention;
FIG. 2 is a fragmentary sectional view taken substantially along the line 2-2 in FIG. 1; and
FIG. 3 is a fragmentary sectional view similar to that of FIG. 2 but showing a modified embodiment of the invention.

Detailed Description of Preferred Embodiments

[0012] FIGS. 1 and 2 illustrate a fixed displacement vane pump 10 in accordance with a presently preferred embodiment of the invention as comprising a vane pump cartridge subassembly 12 mounted between an inlet end cover 14 and an outlet end cover 16. Cartridge 12 includes a rotor 18 having a plurality of radially oriented angularly spaced slots in which a corresponding plurality of vanes 20 are radially slidably disposed. An inlet side plate 22 and an inlet wafer or port plate 24 are disposed on one axial side of rotor 18, and an outlet side plate 26 and an outlet wafer or port plate 28 are disposed on the opposing axial side of rotor 18. A cam ring 30 is fixedly mounted by pins 32 between side plates 22, 26 radially and circumferentially surrounding rotor 18 and vanes 20. There are thus formed between angularly spaced vanes 20, between the axially spaced surfaces of wafer plates 24, 28, and between the radially spaced surfaces of rotor 18 and cam ring 30 a circumferential array of fluid pumping chambers 34 (FIG. 2). A plurality of angularly spaced screws 36 extend through side plates 22, 26, wafer plates 24, 28 and cam ring 30 for holding cartridge 12 as an assembly.

[0013] Inlet cover 14 has a central recess or pocket 38 formed by an axially extending flange 40 that surrounds cartridge 12 in assembly. Outlet cover 16 is fastened to inlet cover 14 by a plurality of screws 42 (FIG. 2). O-ring seals are carried by cartridge 12 and covers 14, 16 for sealingly joining the covers to each other and to cartridge 12 where appropriate. A shaft 44 is rotatably carried by bearings 46, 47 in side plate 22 and cover 16 respectively, and is coupled to rotor 18 of cartridge 12 for providing input drive to the pump mechanism. Inlet cover 14 has a radially opening inlet port 48. Port 48 opens to an inlet chamber 49 that surrounds cartridge 12, and is connected by ports 50 in side plate 22 and wafer plate 24 both to pumping chambers 34 surrounding rotor 18 and to the under-vane chambers in rotor 18 for urging the vanes radially outwardly against the opposing surface of cam ring 30. Pumping chambers 34 are also connected through ports 52 (FIG. 2) in wafer plate 28 and side plate 26 to an outlet port 54 that opens radially from outlet cover 16.

[0014] To the extent thus far described, pump 10 is of generally conventional construction. Rotation of shaft 44 by an external source of pumping energy rotates rotor 18 and reciprocates vanes 20 with respect to cam ring 30. The positive displacement pumping action in the inter-vane chambers pulls fluid through inlet port 48 and inlet cavity 49 surrounding cartridge 12, and pumps the fluid through the cartridge outlet ports and pump outlet port 54. Pressure applied to the pump creates a reaction torque on cartridge 12, which must be absorbed by the surrounding housing formed by covers 14, 16.

[0015] In accordance with the present invention, a pin 60 (FIG. 2) is affixed to and extends radially outwardly from cam ring 30 of cartridge 12 into close engagement with an opposing pocket 62 formed in flange 40 of inlet cover 14. Pin 60 is preferably of solid cylindrical construction, and cooperates with slot 62 in cover 14 for absorbing the reaction torque generated by the pumping cartridge. The axis of pin 60 is radial to the axis of shaft 44. Pocket 62 preferably comprises an axial slot in flange 40 that is either cast into the cover flange, or is

machined into the flange following the forming operation. A secondary slot 64 preferably is machined or otherwise formed on the opposite side of housing cover 14 for allowing pumping cartridge 12 to be assembled to the housing in opposite orientation - i.e., for pumping rotation in either direction. Slot 64, which is angularly spaced from slot 62, receives in assembly a pin 66, which is mounted to and projects radially from cam ring 30, and which may be of smaller dimension than cam pin 60. Pin 66 ensures that pumping cartridge 12 will be assembled to end cover 14 at proper angular orientation.

[0016] In assembly, pin 60 is press fitted into cam ring 30, or secured by adhesive within its cam ring opening. Pin 66, which may be a spring roll pin, is press fitted into ring 30. After cartridge 12 is assembled, the cartridge is axially fitted into pocket 38 by axial movement of pins 60, 66 into their associated pockets 62, 64. Pin 60 has a close sliding fit into pocket 62, but pin 66 may be much smaller than pocket 64 since the only function of pin 66 is to prevent misalignment during assembly. Thus pins 60, 66 together serve to time the cartridge input and output ports with respect to the pump housing, while pin 60 alone absorbs reaction forces on the cam ring.

[0017] By locating torque pin 60 on cam ring 30, and thus at the point of largest outside diameter of pumping cartridge 12, the force on pin 60 due to the reaction forces between the pumping cartridge and the surrounding housing is reduced to a minimum. This reaction torque is taken directly from the cam ring to the housing, as opposed to absorbing the torque through other intermediate components. As loading is increased, the cam ring expands so as to be completely radially supported by the surrounding housing structure, so that forces applied to the pin are pure shear forces without any bending forces or moments. These shear forces are in a plane perpendicular to the axis of the pin.

[0018] FIG. 3 illustrates a modified embodiment of the invention in which, instead of individual slots 62, 64 in FIG. 2, torque pin 60 and orientation pin 66 are disposed at angularly spaced edges of inlet flow flow chamber 49 in inlet cover 14a. Reaction torque on the pumping cartridge is still absorbed by cover 14 of the pump housing, as in the embodiment of FIGS. 1 and 2, since such torque is unidirectional. That is, torque pin 60 need only abut end cover 14 from one angular direction, corresponding to the direction of rotation of the pumping mechanism within the housing.

[0019] Although the invention has been described in connection with two presently preferred embodiments thereof, modifications and variations are envisioned. For example, the invention is by no means limited to cartridge-type pumps, but can be employed in connection with all types of vane pumps. Pin 60 need not be cylindrical, but may have a flat machined in it or be replaced by a key of square cross section.

Claims

1. A fixed displacement vane-type hydraulic machine (10) that comprises:

   a vane-type fluid mechanism (12) including a rotor (18), a plurality of vanes (20) carried by said rotor, side plates (22, 26) on opposed sides of said rotor, and a cam ring (30) carried between said side plates (22, 26) surrounding said vanes and rotor to define fluid chambers (34) between said vanes,
   housing means (14, 16) surrounding and enclosing said mechanism, including inlet (48, 49) and outlet (54) passage means for feeding fluid to and from said chambers,
   a shaft (44) coupled to said rotor and extending from said housing means, and torque means (60) extending radially between said mechanism (12) and said housing means (14, 16) and preventing rotation of said mechanism with respect to said housing means so as to absorb reaction torque on said mechanism with respect to said housing means due to pressure applied to said machine,
   said torque means (60) being affixed to said cam ring (30) and extending into an opposed radial pocket (62) in said housing means,

   characterised in that the pocket (62) is formed by said inlet and outlet passage means.

2. The machine set forth in claim 1 wherein said pocket (62) extends axially through said housing means to facilitate assembly of said cam ring and mechanism to said housing means.

3. The machine set forth in claim 1 or claim 2 wherein said mechanism (12) comprises a cartridge assembly; wherein said housing means includes inlet (14) and outlet (16) covers, and means (42) mounting said inlet and outlet covers to each other to enclose said cartridge; and wherein said pocket (62) comprises a slot extending axially into one said covers.

4. The machine set forth in claim 1 wherein said housing includes a pair of said radial pockets (62) angularly spaced from each other, such that said housing means is adapted to receive cartridges for rotation in either direction.

5. The machine set forth in claim 4 wherein there are a pair of means (60, 66) mounted on said cam ring for receipt in said pockets.

6. The machine set forth in claim 5 wherein one (66) of said pair of means comprises locating means preventing misorientation of said mechanism in

said housing means while the other (60) of said pair of means comprises said torque means.

7. A method of constructing a vane-type hydraulic machine (10) that comprises the steps of:

(a) forming a fluid mechanism (12) that includes a rotor (18), a plurality of vanes (20) slidably carried by said rotor (18), side plates (22, 26) on opposed sides of said rotor (18) defining fluid chambers (34) between said vanes (20), a cam ring (30) radially surrounding said rotor (18), and a torque means (60) projecting radially outwardly from said cam ring (30),
(b) forming a pair of end covers (14, 16), one of which has a recess (38) for receiving said mechanism (12), the end covers comprising inlet and outlet passage means (48, 49; 54) a flange (40) surrounding said recess (38) and an axially extending pocket in said flange,
(c) assembling said mechanism to said one cover by sliding a pin into the axially extending pocket (62) while positioning said mechanism in said recess (38), and
(b) assembling said end covers (14, 16) to each other so as to capture said mechanism (12) within said end covers,

the torque means (60) extending into an opposed radial pocket (62) in said pair of end covers (14, 16),

characterised in that the radial pocket (62) is formed by said inlet and outlet passage means (48, 49; 54).

8. The method set forth in claim 7 wherein said pocket (62) is machined in said flange.

9. The method as set forth in claim 7 wherein said pocket (62) is cast into said flange.

10. The method set forth in any of claims 7 to 9 wherein said step (b) includes the step of forming a pair of said pockets (62) angularly spaced from each other in said flange (40), wherein said step (a) comprises the step of providing a pair of pins (60, 66) projecting radially outwardly from said cam (30) ring and angularly spaced from each other, and wherein said step (c) comprises the step of positioning said pins (60, 66) in respective ones of said pockets (62), one (66) of said pins serving to orient said cartridge with respect to said one end cover and the other (60) functioning in operation of said machine to absorb reaction torque on said cam ring.

Patentansprüche

1. Schieber-Hydraulikantrieb (10) mit fester Verdrängung mit:

einem Schieber-Fluidmechanismus (12) mit einem Rotor (18), einer Mehrzahl von Schiebern (20), die von dem Rotor getragen werden, Seitenplatten (22, 26) auf entgegengesetzten Seiten des Rotors sowie einem Nockenring (30), der zwischen den Seitenplatten (22, 26) abgestützt ist und die Schieber und den Rotor umgibt, um Fluidkammern (34) zwischen den Schiebern festzulegen,

einer Gehäuseanordnung (14, 16), welche den Mechanismus umgibt und einschließt und eine Einlassanordnung (48, 49) und eine Auslassanordnung (54) aufweist, um den Kammern Fluid zuzuführen bzw. von diesen abzuziehen,

einer Welle (44), die mit dem Rotor gekoppelt ist und sich von der Gehäuseanordnung aus erstreckt, sowie einer Drehmomentanordnung (60), die sich radial zwischen dem Mechanismus (12) und der Gehäuseanordnung (14, 16) erstreckt und eine Drehbewegung des Mechanismus relativ zu der Gehäuseanordnung verhindert, um ein Reaktionsdrehmoment zu absorbieren, welches auf den Mechanismus bezüglich der Gehäuseanordnung aufgrund eines Druckes wirkt, mit welchem der Antrieb beaufschlagt ist,

wobei die Drehmomentanordnung (60) an dem Nockenring (30) befestigt ist und sich in eine entgegengesetzte radiale Tasche (62) in der Gehäuseanordnung erstreckt,
dadurch gekennzeichnet, dass die Tasche (62) von der Einlassanordnung und der Auslassanordnung gebildet wird,

2. Antrieb gemäß Anspruch 1, wobei sich die Tasche (62) axial durch die Gehäuseanordnung hindurch erstreckt, um die Montage des Nockenrings und des Mechanismus an der Gehäuseanordnung zu erleichtern.

3. Antrieb gemäß Anspruch 1 oder 2, wobei der Antrieb (12) eine Kassettenbaugruppe aufweist; wobei die Gehäuseanordnung eine Einlassabdeckung (14) und eine Auslassabdeckung (16) sowie eine Anordnung (42) zur Montage der Einlass- und der Auslassabdeckung aneinander aufweist, um die Kassette zu umschließen; und wobei die Tasche (62) einen Schlitz aufweist, der sich axial in eine der Abdeckungen erstreckt.

4. Antrieb gemäß Anspruch 1, wobei das Gehäuse ein von zwei der radialen Taschen (62) gebildetes Paar aufweist, die in Winkelabstand voneinander angeordnet sind, so dass die Gehäuseanordnung dazu in der Lage ist, Kassetten zur Drehung in jeder der beiden Richtungen aufzunehmen,

5. Antrieb gemäß Anspruch 4, wobei ein Paar von Mitteln (60, 66) vorgesehen ist, die an dem Nockenring montiert sind, um in den Taschen aufgenommen zu werden.

6. Antrieb gemäß Anspruch 5, wobei eines (66) der Mittd des Paars von Mitteln eine Lokalisierungsanordnung aufweist, die eine Fehlorientierung des Mechanismus in der Gehäuseanordnung verhindert, während das andere (60) des Paars von Mitteln die Drehmomentanordnung aufweist.

7. Verfahren zum Aufbauen eines Schieber-Hydraulikantriebs (10), wobei im Zuge des Verfahrens:

a) ein Fluidmechanismus (12) gebildet wird, der einen Rotor (18), eine Mehrzahl von gleitend von dem Rotor (18) getragenen Schiebern (20), Seitenplatten (22, 26) auf gegenüberliegenden Seiten des Rotors (18), die Fluidkammern (34) zwischen den Schiebern (20) festlegen, einen Nockenring (30), der den Rotor (18) radial umgibt, sowie eine Drehmomentanordnung (60), die sich von dem Nockenring (30) aus radial nach außen erstreckt, aufweist,

b) ein Paar von Endabdeckungen (14, 16) gebildet wird, wobei eine der Endabdeckungen eine Ausnehmung (38) zur Aufnahme des Mechanismus (12) aufweist, wobei die Endabdekkungen eine Einlass- und Auslassanordnung (48, 49; 54), einen Flansch (40), der die Ausnehmung (38) umgibt, sowie eine sich in axialer Richtung in dem Flansch erstreckende Tasche aufweisen,

c) der Mechanismus an der besagten Abdekkung angebracht wird, indem ein Stift in die sich in axialer Richtung erstreckende Tasche (62) eingeschoben wird, während der Mechanismus in der Ausnehmung (38) positioniert wird, und

d) die Endabdeckungen (14, 16) aneinander montiert werden, um den Mechanismus (12) zwischen den Endabdeckungen einzuschließen.

wobei sich die Drehmomentanordnung (60) in eine entgegengesetzte radiale Tasche (62) in dem Paar von Endabdeckungen (14, 16) erstreckt,

dadurch gekennzeichnet, dass die radiale Tasche (62) von der Einlass- und Auslassanordnung (48, 49, 54) gebildet wird.

8. Verfahren gemäß Anspruch 7, wobei die Tasche (62) mittels spanender Bearbeitung in den Flansch eingearbeitet wird.

9. Verfahren gemäß Anspruch 7, wobei die Tasche (62) mittels Gießtechnik in dem Flansch ausgebildet wird.

10. Verfahren gemäß einem der Ansprüche 7 bis 9, wobei in dem Schritt b) ein Paar der Taschen (62) in Winkelabstand voneinander in dem Flansch (40) ausgebildet wird, wobei in dem Schritt a) ein Paar von Stiften (60, 66) bereitgestellt wird, welche sich von dem Nockenring (30) aus radial nach außen erstrecken und in Winkelabstand voneinander angeordnet sind, und wobei in dem Schritt c) die Stifte (60, 66) jeweils in der entsprechenden Tasche (62) positioniert werden, wobei einer (66) der Stifte dazu dient, die Kassette bezüglich der besagten Endabdeckung auszurichten, und der andere (60) der Stifte beim Betrieb des Antriebs dafür vorgesehen ist, Reaktionsdrehmoment auf dem Nockenring zu absorbieren.

Revendications

1. Machine hydraulique du type à palettes à cylindrée constante (10) qui comprend :

un mécanisme à fluide du type à palettes (12) comprenant un rotor (18), une pluralité de palettes (20) portées par ledit rotor, des plaques latérales (22, 26) sur des côtés opposés dudit rotor, et un anneau de came (30) porté entre lesdites plaques latérales (22, 26) entourant lesdites palettes et le rotor afin de définir des chambres de fluide (34) entre lesdites palettes, un moyen de carter (14, 16) entourant et enfermant ledit mécanisme, comprenant des moyens de passage d'entrée (48, 49) et de sortie (54) destinés à alimenter lesdites chambres en fluide et à délivrer du fluide depuis celles-ci, un arbre (44) couplé audit rotor et s'étendant depuis ledit moyen de carter, et un moyen de couple (60) s'étendant radialement entre ledit mécanisme (12) et ledit moyen de carter (14, 16) et empêchant la rotation dudit mécanisme par rapport audit moyen de carter de façon à absorber le couple de réaction sur ledit mécanisme par rapport audit moyen de carter en raison de la pression appliquée à ladite machine, ledit moyen de couple (60) étant fixé audit anneau de came (30) et s'étendant dans une po-

che radiale opposée (62) dans ledit moyen de carter,

caractérisée en ce que la poche (62) est formée par lesdits moyens de passage d'entrée et de sortie.

2. Machine selon la revendication 1, dans laquelle ladite poche (62) s'étend axialement à travers ledit moyen de carter afin de faciliter l'assemblage dudit anneau de came et dudit mécanisme sur ledit moyen de carter.

3. Machine selon la revendication 1 ou la revendication 2, dans laquelle ledit mécanisme (12) comprend un ensemble de cartouche, dans laquelle ledit moyen de carter comprend des protections d'entrée (14) et de sortie (16), et un moyen (42) montant lesdites protections d'entrée et de sortie l'une sur l'autre pour enfermer ladite cartouche, et dans laquelle ladite poche (62) comprend une fente s'étendant axialement dans l'une desdites protections.

4. Machine selon la revendication 1, dans laquelle ledit carter comprend une paire desdites poches radiales (62) angulairement espacées l'une de l'autre, de sorte que ledit moyen de carter est conçu pour recevoir des cartouches en vue d'une rotation dans chaque direction.

5. Machine selon la revendication 4, dans laquelle il existe une paire de moyens (60, 66) montés sur ledit anneau de came en vue d'une réception dans lesdites poches.

6. Machine selon la revendication 5, dans laquelle un moyen (66) parmi ladite paire de moyens comprend un moyen de positionnement empêchant une mauvaise orientation dudit mécanisme dans ledit moyen de carter tandis que l'autre (60) de ladite paire de moyens comprend ledit moyen de couple.

7. Procédé de conception d'une machine hydraulique du type à palettes (10) qui comprend les étapes consistant à :

(a) former un mécanisme à fluide (12) qui comprend un rotor (18), une pluralité de palettes (20) portées avec possibilité de coulissement par ledit rotor (18), des plaquettes latérales (22, 26) sur les côtés opposés dudit rotor (18) définissant des chambres de fluide (34) entre lesdites palettes (20), un anneau de came (30) entourant radialement ledit rotor (18), et un moyen de couple (60) faisant radialement saillie vers l'extérieur depuis ledit anneau de came (30),
(b) former une paire de protections d'extrémité (14, 16), dont l'une comporte un évidement (38) en vue de recevoir ledit mécanisme (12), les protections d'extrémité comprenant des moyens de passage d'entrée et de sortie (48, 49 ; 54), un rebord (40) entourant ledit évidement (38) et une poche s'étendant axialement dans ledit rebord,
(c) assembler ledit mécanisme sur ladite une protection en faisant coulisser une broche dans la poche s'étendant axialement (62) tout en positionnant ledit mécanisme dans ledit évidement (38), et
(b) assembler lesdites protections d'extrémité (14, 16) l'une sur l'autre de façon à prendre ledit mécanisme (12) à l'intérieur desdites protections d'extrémité,

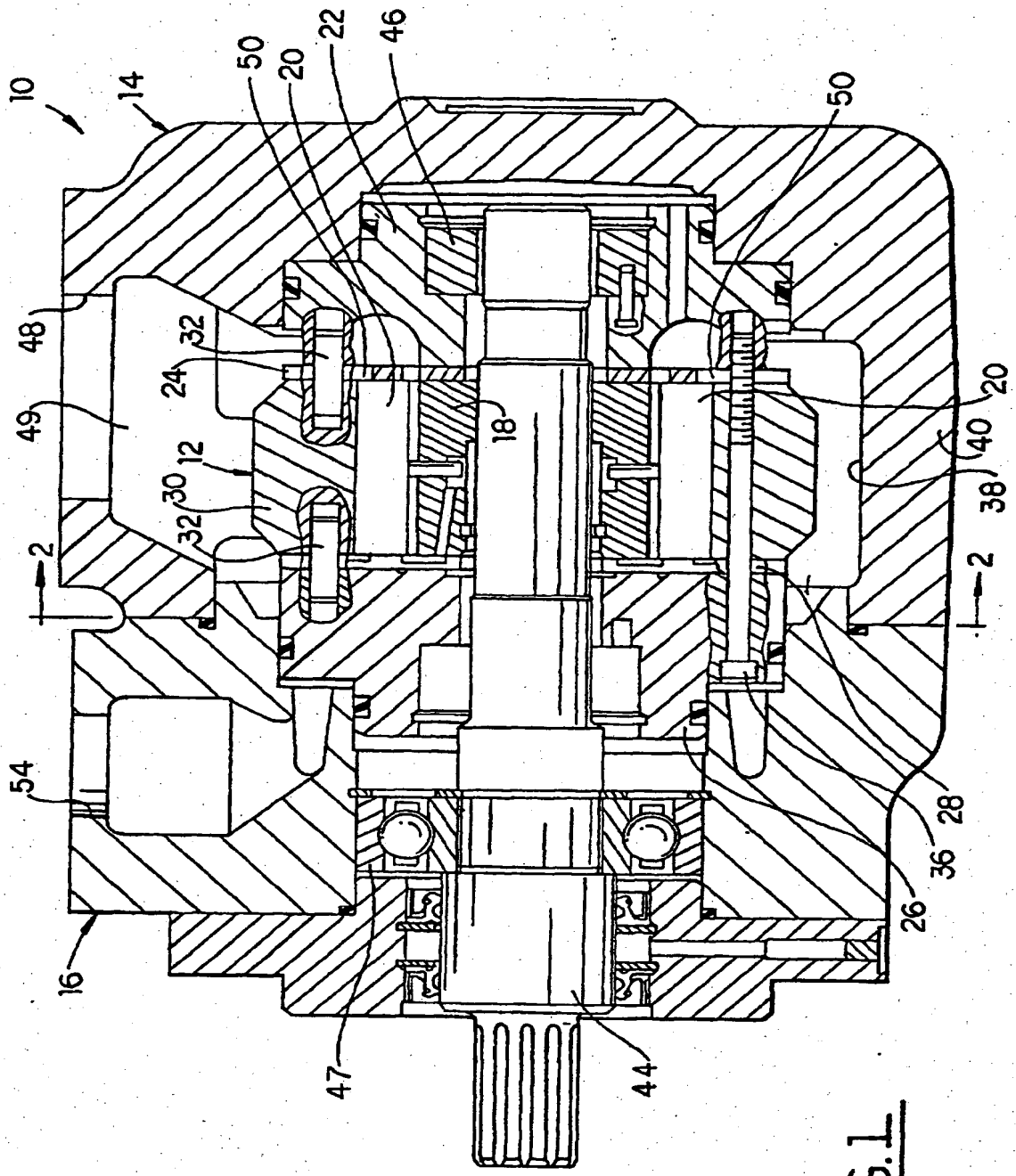
le moyen de couple (60) s'étendant dans une poche radiale opposée (62) dans ladite paire de protections d'extrémité (14, 16),

caractérisé en ce que la poche radiale (62) est formée par lesdits moyens de passage d'entrée et de sortie (48, 49 ; 54).

8. Procédé selon la revendication 7, dans lequel ladite poche (62) est usinée dans ledit rebord.

9. Procédé selon la revendication 7, dans lequel ladite poche (62) est moulée dans ledit rebord.

10. Procédé selon l'une quelconque des revendications 7 à 9, dans lequel ladite étape (b) comprend l'étape consistant à former une paire desdites poches (62) angulairement espacées l'une de l'autre dans ledit rebord (40), dans lequel ladite étape (a) comprend l'étape consistant à fournir une paire de broches (60, 66) faisant radialement saillie vers l'extérieur depuis ledit anneau de came (30) et angulairement espacées l'une de l'autre, et dans lequel ladite étape (c) comprend l'étape consistant à positionner lesdites broches (60, 66) dans des poches respectives parmi lesdites poches (62), une première broche (66) parmi lesdites broches servant à orienter ladite cartouche par rapport à ladite une protection d'extrémité et l'autre (60) fonctionnant lors du fonctionnement de ladite machine pour absorber le couple de réaction sur ledit anneau de came.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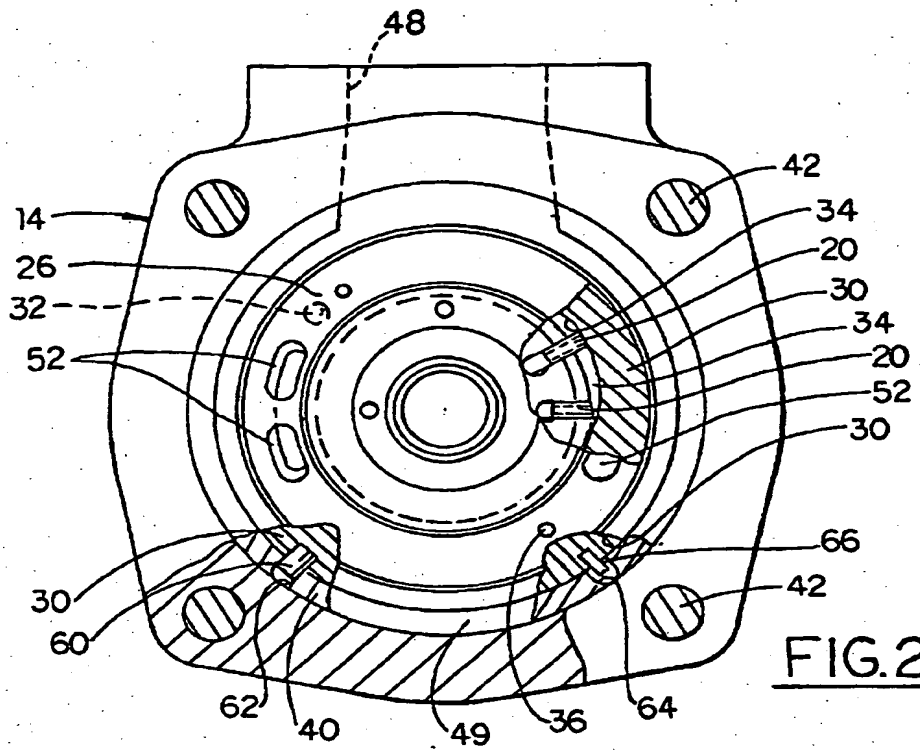
44

FIG.1


48
42
14
34
26
20
32
30
34
52
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52
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66
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42
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62
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49
36
64

FIG.2

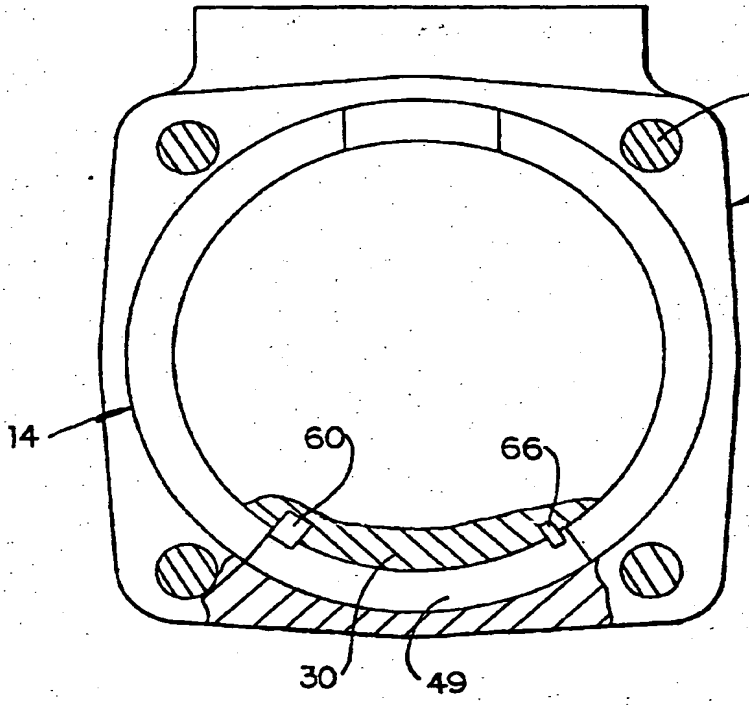
42
14a
14
60
66
30
49

FIG.3